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THE INFLUENCE OF FACIAL ATTRACTIVENESS AND BABYFACENESS ON ACTORS'
MEMORABILITY

A Thesis
presented in partial fulfillment of requirements
for the degree of Master of Arts
in the Department of Psychology
University of Mississippi

by

APRIL M. BURNS

May 2015

ABSTRACT

While researchers suggest that people displaying emotional expressions are memorable because of meanings associated with the expressions, the current study explored whether other facial characteristics, such as attractiveness and babyfacedness, how much an adult's face resembles a baby's, influence memorability as well. Introductory psychology students (150 female, 53 male) participated in an incidental memory task in which they attempted to recognize actors they had previously seen displaying emotional expressions who varied in both emotional attractiveness, how attractive actors appear due to changes in facial features associated with displaying emotional expressions, and emotional babyfacedness, how babyfaced actors appear due to changes in facial features associated with displaying emotional expressions. As predicted, the interaction of emotional attractiveness and emotional babyfacedness predict the variance in memorability for actors displaying fearful expressions, but not for actors displaying happy or angry expressions. The current study suggests, then, that people's attractiveness and babyfacedness when displaying an emotional expression seem to influence how well they will be recognized when displaying fearful expressions. These results suggest that people who use eyewitness identification judgments, such as those in law enforcement, should consider the attractiveness and babyfacedness of those depicted when developing photos that will be used for eyewitness identification tasks.

DEDICATION

This thesis is dedicated to the friends, family, and coworkers who helped me throughout this lengthy process. Their belief in me made this project possible.

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Many, many thanks to my advisor, Dr. Marilyn Mendolia and my committee members, Dr. Matthew Reysen, and Dr. Elicia Lair.

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I. INTRODUCTION

Over the course of a day, a person can expect to see several people. Some of these people will look familiar, but others will not. While a person might expect to see unfamiliar people, especially if he or she lives in a large, urban area, he or she may find the experience of encountering someone who seems to know him or her, but whom he or she can't remember, troublesome. Obviously, most people can recognize at least some of the people they encounter, otherwise everyone would seem unfamiliar all of the time. There must be some characteristics of people's faces, then, that make some people more memorable than others.

One way to try to determine which facial characteristics might influence a person's memorability is to think about some basic facial attributes. People can pay attention to many different things when looking at faces: facial features, attractiveness, skin texture, etc. Because there are so many characteristics of a face, it seems as though identifying which characteristics might influence memorability and why they do so might help us to understand why some people's faces are more memorable than others. Both expressed emotion and attractiveness influence memorability, although questions remain as to how these characteristics do so. Babyfacedness is a facial characteristic that relates to both: Emotional expressions vary in babyfacedness, and babyfaced people are considered more attractive. Examining babyfacedness and its relation to both expressed emotion and attractiveness, therefore, may help us to understand how expressed emotion and attractiveness influence memorability.

A. Attractiveness and Memorability

Like many other facial characteristics, attractiveness varies across faces. Most people

have perceived some faces to be either “highly attractive” or “unattractive.” People take note of those they perceive to be highly attractive and unattractive because attractiveness is associated with other qualities that people may or may not want to be associated with. For example, those who are perceived as very attractive are also perceived as more socially desirable and more likely to have desirable careers than those who are perceived as unattractive (Dion, Berscheid, & Walster, 1972). People are likely to pay attention to those they perceive to be very attractive, then, because pursuing either romantic or platonic relationships with very attractive people means that a person may get to benefit from the very attractive person’s positive qualities. People may pay attention to those they perceive to be unattractive because they may want to avoid them so that they are not associated with the unattractive person’s less desirable qualities. Faces that are perceived to be highly attractive or unattractive, therefore, may stand out from faces perceived to be moderately attractive. Because these faces seem to stand out, attractiveness seems like a facial characteristic that would influence memorability.

When considering the influence of attractiveness on memorability, empirical evidence seems to align with what anecdotal evidence suggests. Highly attractive actors are more memorable than moderately attractive actors (Fleishman, Buckley, Klosinsky, Smith, & Tuck, 1976; Marzi & Viggiano, 2010; Shepherd & Ellis, 1973). For unattractive actors, however, the relationship between attractiveness and memorability is less clear. Some studies find that both highly attractive and unattractive actors are more memorable than moderately attractive actors (Fleishman et al., 1976; Shepherd & Ellis, 1973). Other studies find that highly attractive actors are more memorable than actors from any other attractiveness categories, and unattractive actors are more attractive than only low attractive actors (Marzi & Viggiano, 2010). Finally, some studies find that unattractive actors are more memorable than attractive actors (Light, Hollander,

& Kayra-Stuart, 1981; Wiese, Altmann, & Schweinberger, 2014). Overall, then, attractiveness seems to influence person identity recognition, although more research is necessary to determine which level of attractiveness influences memorability the most. Because previous studies exploring the relationship between attractiveness and actors' memorability have only used actors displaying neutral expressions, furthermore, it is difficult to predict how attractiveness may influence person identity recognition for actors displaying emotional expressions.

The current study will provide preliminary data on how attractiveness may interact with expressed emotion to influence memorability. Displaying different emotional expressions may cause actors to appear more or less attractive. Changes in attractiveness due to changes in facial features related to displaying an emotional expression will be referred to as emotional attractiveness to emphasize the influence of displaying an emotional expression on attractiveness. Since highly attractive and unattractive actors are memorable, displaying emotional expressions that increase or decrease actors' emotional attractiveness, as compared to displaying emotional expressions that do not influence actors' emotional attractiveness, may enhance actors' memorability.

B. Emotional Expressions and Memorability

Before considering how different emotional expressions contribute to attractiveness, it is important to look at how emotional expressions influence memorability. Previous research exploring the influence of emotional expressions on memorability suggests that actors previously seen displaying happy expressions are more memorable than actors previously seen displaying either angry expressions (D'Argembeau & Van der Linden, 2007, 2011; D'Argembeau, Van der Linden, Comblain, & Etienne, 2003) or sad expressions (Sergerie, Lepage, & Armony, 2007). Actors previously seen displaying fearful expressions, however, are more memorable than actors

previously seen displaying happy expressions (Righi et al., 2012; Sergerie, Lepage, & Armony, 2005; Wang, 2013).

These results seem somewhat intuitive. People seen displaying happy expressions should be memorable because people displaying these expressions look friendly and approachable (D'Argembeau & Van der Linden, 2007, 2011; D'Argembeau et al., 2003). Likewise, people displaying sad or angry expressions might be less memorable – people displaying these expressions may attack, in the case of people displaying angry expressions (D'Argembeau & Van der Linden, 2007, 2011; D'Argembeau et al., 2003), or prefer to be left alone, in the case of people displaying sad expressions. For happy, sad, and angry expressions, then, previous research coincides with expectations drawn from the meanings associated with different expressions – actors seen displaying expressions signaling friendliness are more memorable, while actors seen displaying expressions signaling unfriendliness are less memorable. Why, then, does displaying a fearful expression enhance memorability? People displaying these expressions look neither friendly nor approachable (Righi et al., 2012).

Analyzing shared characteristics of sad, angry, and fearful expressions may help to explain why these expressions differ in their influences on memorability. Specifically, the characteristics of valence, meaning, and temporality will be discussed. To begin, sad, angry, and fearful expressions are all negatively-valenced. Displaying sad or angry expressions decreases memorability, as compared to displaying happy expressions. Logic would suggest, then, that because fearful expressions are also negatively-valenced, displaying these expressions would be more likely to decrease memorability as compared to displaying happy expressions. Because displaying a fearful expression enhances memorability, however, valence does not help to explain why sad, angry, and fearful expressions influence memorability differently.

While sad, angry, and fearful expressions have the same valence, these expressions differ in meaning. Fearful expressions, for example, differ from sad expressions in that sad expressions indicate loss, while fearful expressions indicate threat (Ekman & Friesen, 2003). Because fearful expressions indicate threat, actors displaying these expressions may draw more of participants' attention and, therefore, may be encoded more accurately (Righi et al., 2012; Sergerie et al., 2005) than actors displaying sad expressions. Angry expressions, however, also indicate threat. Granted, angry and fearful expressions indicate different types of threat. People displaying angry expressions are signaling that they, themselves, are a threat: they are likely to attack what they perceive to be the source of their anger (Ekman & Friesen, 2003). People displaying fearful expressions, on the other hand, are signaling that they perceive a threat. While fearful and angry expressions indicate different types of threat, both seem as though they would draw more attention from people perceiving these expressions. Actors seen displaying fearful expressions may draw attention because they indicate a nearby threat, while actors seen displaying angry expressions may draw attention because they indicate that the actor may be preparing to attack the viewer.

In addition to being related in meaning, angry and fearful expressions also seem to be related in temporality -- people can experience fear before they experience anger, or they can experience fear and anger simultaneously (Ekman & Friesen, 2003). Because both angry and fearful expressions indicate threat and can occur close together in time, if not simultaneously, one might expect actors seen displaying either angry or fearful expressions to be more memorable than actors seen displaying happy expressions. Angry and fearful expressions, however, do not influence memorability in the same way. While actors seen displaying fearful expressions are more memorable than actors seen displaying happy expressions, actors seen

displaying angry expressions are less memorable than actors seen displaying happy expressions. Fearful and angry expressions, therefore, must differ on some other dimension in order to cause these contrasting effects on memorability.

C. Babyfacedness

One dimension on which angry and fearful expressions differ is babyfacedness.

Babyfacedness refers to the degree to which an adult's face resembles a baby's. Several facial features contribute to babyfacedness, including hair and eye coloring, eye, nose, mouth, chin and face shape, and overall facial appearance (Berry & McArthur, 1985; Zebrowitz, 1997). For example, babyfaced people tend to have larger eyes, larger mouths, smaller noses, and smaller chins. In addition to causing one to appear more baby-like, babyfacedness also leads to impressions about one's personality. For example, people tend to assume that babyfaced adults are weak and dependent, but also warm and affectionate (Zebrowitz, 1997).

In addition to influencing perceptions of personality, babyfacedness also relates to attractiveness. People like babyfaced individuals, in general, because they elicit feelings of protection and nurturance, similar to the way people feel toward infants (Zebrowitz, 1997). The positive feelings associated with baby-like faces help explain, in part, why people prefer features such as large eyes and smaller noses in both men and women (Cunningham, 1986; Cunningham, Barbee, & Pike, 1990; Zebrowitz, 1997). Faces, and even individual features, that remind viewers of infants will elicit positive responses that are similar to those elicited by infants.

While babyfacedness is a static characteristic of individual faces, certain facial expressions may influence how babyfaced people appear. Changes in babyfacedness due to changes in facial features related to displaying an emotional expression will be referred to as emotional babyfacedness. Angry and fearful expressions, for example, differ on the dimension of emotional

babyfacedness. Specifically, actors displaying angry expressions tend to be seen as more mature and dominant, while actors displaying fearful expressions tend to be seen as more babyish (Marsh, Adams, & Kleck, 2010). Angry and fearful expressions are also remembered more or less accurately, depending on the emotional babyfacedness of the actor displaying the expression. When actors are perceived as very babyfaced, participants remember more fearful expressions than angry expressions (Sacco & Hugenberg, 2009). Something about displaying angry and fearful expressions, therefore, seems to change how participants perceive actors' babyfacedness.

D. Emotional Expressions and Babyfacedness

Displaying angry and fearful expressions may change how participants perceive actors' babyfacedness because displaying emotional expressions changes the appearance of different facial features (Ekman & Friesen, 2003). For example, when displaying a fearful expression, people tend to raise their eyebrows and open their eyes, making their eyes appear larger and rounder and moving their eyebrows higher on their foreheads (Ekman & Friesen, 2003). When displaying an angry expression, people lower their eyebrows and tense their eyelids, making their eyes appear smaller (Ekman & Friesen, 2003).

As previously mentioned, several characteristics, such as large eyes and a small chin contribute to babyfacedness. Displaying different emotional expressions, such as fearful or angry expressions, therefore, causes changes to the appearance of facial features that may influence how babyfaced a person appears. For example, larger eyes and high eyebrows contribute to babyfacedness, so displaying a fearful expression should increase emotional babyfacedness. Smaller eyes detract from babyfacedness, so displaying an angry expression should decrease emotional babyfacedness.

So, angry and fearful expressions may differ in emotional babyfacedness because

displaying these expressions causes changes in the appearance of facial features that are related to babyfacedness. These expressions, however, are not the only ones that cause changes in the appearance of facial features related to babyfacedness. When displaying happy expressions, for example, people draw the corners of their lips up and back, raise their cheeks, may or may not open their mouths to expose their teeth, and may raise their eyelids (Ekman & Friesen, 2003). Although a happy expression may make the eyes appear smaller, it also makes the cheeks appear fuller, and this should increase babyfacedness. When displaying sad expressions, however, people raise the inner corners of their eyelids and eyebrows, and the corners of their lips go down (Ekman & Friesen, 2003). A sad expression makes the eyes and lips appear smaller, and this should decrease babyfacedness. When displaying surprised expressions, people raise their eyebrows and eyelids, and their mouths are open, but relaxed (Ekman & Friesen, 2003). A surprised expression makes the eyes to appear larger, and this should increase babyfacedness.

1. Emotional Expressions, Babyfacedness, Attractiveness, and Memorability.

As previously mentioned, babyfacedness relates to attractiveness. Babyfaced people are perceived as attractive because they elicit positive feelings, similar to those attributed to babies (Zebrowitz, 1997). Displaying an emotional expression that influences a person's emotional babyfacedness, then, may influence that person's emotional attractiveness as well. Specifically, displaying an emotional expression that increases emotional babyfacedness should increase emotional attractiveness, while displaying an emotional expression that decreases emotional babyfacedness should decrease emotional attractiveness. For example, because displaying angry expressions decreases actors' emotional babyfacedness, displaying angry expressions may decrease actors' emotional attractiveness.

Displaying an emotional expression may influence actors' memorability, then, because

displaying emotional expressions influences actors' emotional babyfacedness which influences actors' emotional attractiveness, and attractiveness has been demonstrated to be related to memorability (Fleishman et al., 1976; Light et al., 1981; Marzi & Viggiano, 2010; Shepherd & Ellis, 1973; Wiese et al., 2014). In general, because very attractive actors are more memorable than moderately attractive actors (Fleishman et al., 1976; Marzi & Viggiano, 2010; Shepherd & Ellis, 1973), and babyfaced people are considered more attractive than less babyfaced people (Zebrowitz, 1997), actors who are both very attractive and very babyfaced should be more memorable than actors with any other combination of babyfacedness and attractiveness. Because displaying an emotional expression may influence actors' emotional babyfacedness, however, emotional expressions may interact with these proposed influences of attractiveness and babyfacedness. Discussion of how actors' emotional attractiveness and babyfacedness might interact to influence memorability will focus on fearful, happy, and angry expressions as the present study seeks to better understand differences in memorability for actors displaying these expressions.

When people display fearful expressions, their eyes appear larger and their mouths may appear larger as well (Ekman & Friesen, 2003). Larger eyes and lips are associated with babyfacedness (Zebrowitz, 1997), and fearful expressions are associated with increased emotional babyfacedness (Marsh et al., 2010), so displaying a fearful expression should increase actors' emotional babyfacedness. Because increasing emotional babyfacedness should increase emotional attractiveness, actors for whom displaying fearful expressions increases both emotional attractiveness and babyfacedness should be perceived as especially distinctive and attractive as compared to actors displaying fearful expressions who appear to have any other combination of attractiveness and babyfacedness.

When people display happy expressions, their eyes appear smaller, although their mouths may appear larger and the lower half of their faces may appear rounder (Ekman & Friesen, 2003). Smaller eyes are not associated with babyfacedness, but larger lips and rounder faces are (Zebrowitz, 1997), so displaying happy expressions should not influence actors' emotional babyfacedness as much as displaying fearful expressions. Because displaying a happy expression is likely to have a less straightforward influence on emotional babyfacedness than displaying a fearful expression, the interaction of emotional attractiveness and babyfacedness is not expected to influence memorability for actors displaying happy expressions.

Similarly, when people display angry expressions, both their eyes and mouths appear smaller (Ekman & Friesen, 2003). Smaller eyes and mouths are not associated with babyfacedness (Zebrowitz, 1997), and angry expressions are associated with decreased emotional babyfacedness (Marsh et al., 2010), so displaying an angry expression should decrease actors' emotional babyfacedness. The interaction of emotional attraction and babyfacedness, therefore, is not expected to influence memory for actors displaying angry expressions.

E. Hypotheses

This study will explore how the facial characteristics attractiveness and babyfacedness influence memorability across different emotional expressions. Previous studies have demonstrated that memorability is increased for very attractive and unattractive actors, so attractiveness is expected to predict a significant amount of the variance in actors' memorability, participants' confidence in the accuracy of their recognition judgments, and the time it takes participants to make their recognition judgments, regardless of expression. Displaying a fearful expression should increase actors' emotional babyfacedness, so the interaction of emotional attractiveness and emotional babyfacedness is expected to predict a significant amount of the variance in memorability, participants' confidence in the accuracy of their recognition judgments,

and the time it takes participants to make their recognition judgments for actors displaying fearful expressions. Because displaying a happy or angry expression is not expected to increase actors' emotional babyfacedness, the interaction of emotional attractiveness and emotional babyfacedness is not expected to predict a significant amount of the variance in memorability, participants' confidence in the accuracy of their recognition judgments, or the time it takes participants to make their recognition judgments for actors displaying happy or angry expressions.

II. METHOD

A. Participants

Participants were 203 undergraduate students (150 female) enrolled in introductory psychology courses at the University of Mississippi. Data for eight participants were removed from analyses due to participants' failure to follow instructions ($n = 7$) or equipment failure ($n = 1$). Participants volunteered to participate in the study in exchange for partial course credit.

B. Materials

Photographs of 39 Caucasian Dutch adults (19 female) from the Radboud Face Database (RaFD; Langner et al., 2010) were used. Photographs were presented as a 6.5 X 4.75 in. (16.51 X 12.07 cm) images in the center of the computer monitor. Actors were photographed in front of a white background wearing a black t-shirt. Actors did not wear glasses, make-up, or jewelry. All male actors were clean-shaven.

Six photographs of each actor were used. In the photographs, each actor displayed an angry, sad, fearful, surprised, neutral, and happy expression. To try to ensure that each actor expressed each emotion as clearly as possible, actors practiced displaying the emotional expressions, both alone and with Facial Action Coding System (FACS) specialists, according to Ekman's Directed Facial Action task (Ekman & Friesen, 1978). All photographs were rated on perceived expression, and agreement among judges for each expression was at least 82%.

During the encoding task, each participant was randomly assigned to one of five groups. The five groups were balanced for the emotional expressions displayed by each actor and actors' sex. Each participant, regardless of group, viewed photographs of the same actors, but the actors

displayed different emotional expressions across groups to try to control for potential influences of actors' displays of particular emotional expressions on memorability. Because there was an odd number of actors and emotional expressions, the number of male and female actors depicted was balanced across groups, instead of within each group. For example, during the encoding task, a participant in one group saw 12 males and 13 females, while a participant in another group saw 13 males and 12 females.

1. Attractiveness.

Six raters (2 male, 4 female) from the University of Mississippi indicated how attractive they perceived each actor to be using a 7-point scale, ranging from 1 (*not attractive*) to 7 (*highly attractive*). Pearson pairwise correlations between raters' ratings ranged from .04 to .64. Effective reliability (Rosenthal & Rosnow, 1984) was .83 among raters and, thus, raters' ratings were averaged across each expression (see Table 1, first column). A one-way analysis of variance was performed to compare actors' attractiveness across the emotional expressions of interest (happy, sad, angry, surprised, and fearful). As predicted, actors' attractiveness was perceived differently across emotional expression, $F(5, 222) = 13.292, p < .001$. Tukey's HSD comparisons revealed that actors were found to be most attractive when displaying happy expressions as compared to all other emotional expressions, all $p_s < .01$. Actors displaying surprised and neutral expressions were found to be more attractive than actors displaying fearful expressions, all $p_s < .05$.

Table 1. Attractiveness and Babyfacedness Means

Emotion	Attractiveness	Babyfacedness	Emotional Attractiveness ¹	Emotional Babyfacedness ²	Hit Rate
Happy	4.13	3.92	.73	.06	62.92
Sad	3.09	4.08	-.31	.22	59.77
Surprised	3.18	4.28	-.22	.42	60.76
Angry	2.82	3.31	-.58	-.55	61.46
Fearful	2.51	4.24	-.88	.38	60.96
Neutral	3.39	3.86	--	--	--

^{1,2}Attractiveness (babyfacedness) rating for neutral expression subtracted from attractiveness (babyfacedness) rating for each emotional expression

2. Babyfacedness.

Nine raters (2 male, 7 female) from the University of Mississippi indicated how babyfaced they perceived each actor to be using a 7-point scale, ranging from 1 (*not at all babyfaced*) to 7 (*extremely babyfaced*). Pearson pairwise correlations between raters' ratings ranged from .29 to .67. Effective reliability (Rosenthal & Rosnow, 1984) was .88 among raters and, thus, raters' ratings were averaged across each expression (see Table 1, column 2). A one-way analysis of variance was performed to compare actors' babyfacedness across the emotional expressions of interest (happy, sad, surprised, angry, and fearful). As predicted, actors' babyfacedness was perceived differently across emotional expression, $F(4, 185) = 10.34, p < .001$. Tukey's HSD comparisons revealed that actors were found to be least babyfaced when displaying angry expressions as compared to any other emotional expression, all $p_s < .01$.

C. Procedure

The participant entered the lab and sat approximately 24 in. (60.96 cm) from the screen

of a 17 in. (43.18 cm) computer monitor. The experimenter stated that the study was designed to assess social perception skill, or how people read each other. Because this study involved incidental memory, the experimenter explained the purpose of the study in this way to provide the participant with a plausible, alternative explanation (a cover story) for each task in the experiment to try to reduce the possibility of hypothesis guessing.

For the encoding task, the participant, while alone, began each trial by viewing a red fixation cross, intended to attract the participant's attention, on the computer screen for approximately .5 s. Then, an actor's photograph replaced the fixation cross and remained on the screen for 5 s. A personality adjective, intended to describe the actor's personality, such as *messy*, replaced the photo and remained on screen for 3 s. While the adjective was on the screen, the participant rated the actor using a 7-point scale ranging from 1 (*not at all*) to 7 (*extremely*) by pressing the corresponding button on the computer keyboard. If the participant failed to rate the actor on the personality adjective, the computer would automatically advance to the next trial after the 3 s had elapsed. The participant completed 25 trials, each lasting approximately 8.5 s: this task took approximately 3 min 30 s to complete. The timing of the encoding task was kept constant for each participant to try to control for possible influences of time elapsed during the encoding task on the participant's performance. The primary purpose of this phase was to have the participant view each actor's face without explicitly telling him or her to do so. The participant's responses during this task, therefore, were not monitored.

The presentation of each personality adjective during the encoding task was not random, but matched with a particular picture. To ensure that the participant's impressions of actors were not biased due to the particular adjective presented with the photograph of an actor, different photographs were matched with different adjectives across groups. For example, a male actor

who was paired with the adjective *messy* in one group was paired with another adjective, such as *lighthearted*, in another group.

After the participant completed the encoding task, the experimenter returned to the room and told the participant the next task, the color-perception task, was designed to assess the relationship between social-perception skills and other types of perception to try to reinforce the cover story that the participant was taking part in a social perception study. After the experimenter left the room, the participant saw a red fixation cross displayed on the screen for approximately .5 s. Then, a color swatch replaced the fixation cross and remained on screen for 5 s. After the participant viewed the color swatch, a color wheel, divided into six sections, numbered one through six, appeared on the screen for 3 s. While the color wheel was on the screen, the participant matched the color swatch to the appropriate location on the color wheel by pressing the appropriate button on the keyboard. If the participant did not match the color swatch within the 3 s, the computer automatically advanced to the next part of the trial. A 7-point confidence scale ranging from 1 (*not at all confident*) to 7 (*very confident*) replaced the color wheel: the participant had 3 s to rate the confidence in his or her judgment of the color swatch by pressing the corresponding number on the computer keyboard. If the participant did not make the confidence judgment within 3 s, the computer program automatically advanced to the next trial.

The color-perception task was a distraction task, intended to both allow time to elapse between the participant's initial exposure to (encoding) and later recognition of (memory) the actors and to familiarize the participant with the confidence rating scale. The participant's responses during the color-perception task, therefore, were not monitored. During the color-perception task, the participant completed 25 trials, each lasting approximately 12.5 s; this task

took approximately 5 min 12 s to complete. The timing of the color-perception task was kept constant for each participant to try to control for any effects of elapsed time between the encoding task and the recognition task on the participant's performance.

After the participant completed the color-perception task, the experimenter returned to the room and stated that another way to assess social perception skill was to measure the participant's memory for people's faces. While alone, the participant viewed a photograph of an actor displaying a neutral expression. The participant then indicated whether he or she recognized the actor from the encoding task. The photograph was then replaced by a confidence scale identical to the one used during color-perception task, and the participant indicated his or her confidence in the accuracy of the recognition decision. During the recognition task, the participant viewed the 25 faces from the encoding task and 12 distractor faces (6 men, 6 women). All actors displayed a neutral expression to try to reduce any potential confounding of identity recognition and picture recognition. Actors' photographs appeared in a random order across participants to try to reduce any potential confounding of picture order and recognition.

The recognition task was intended to assess the participant's memory for each of the actors viewed during the encoding task, so the participant's recognition response for each face presented during the recognition task, as well as his or her reaction time in making the response, and his or her confidence level for the response was recorded using SuperLab computer software (Version 4.0; Cedrus Corporation, 2012). After the participant completed the recognition task, the experimenter returned to the room and explained the experiment in more detail to the participant. At this time, the participant also asked any questions he or she had about the experiment, which the experimenter answered.

III. RESULTS

A. Measurement of Emotional Attractiveness and Babyfaceness

As previously mentioned, actors' attractiveness and babyfaceness varied when actors displayed different emotional expressions (see Table 1, columns 1 and 2). These variations in attractiveness and babyfaceness among emotional expressions were hypothesized to be the result of changes in facial features associated with displaying each of the emotional expressions. To assess whether changes in the actor's facial features, as opposed to static features of the face, were responsible for the variations in attractiveness and babyfaceness, measures of emotional attractiveness and emotional babyfaceness were calculated for each actor. For each characteristic, either attractiveness or babyfaceness, the judgment for each actor's neutral expression, or baseline, was subtracted from the judgment for the actor's happy, sad, surprised, angry, and fearful expressions. In this way, the changes in facial characteristics associated with displaying each emotional expression could be assessed separately from each actor's baseline attractiveness and babyfaceness.

1. Emotional Attractiveness

A one-way analysis of variance was performed to compare actors' emotional attractiveness ratings for happy, sad, surprised, angry, and fearful expressions. As predicted, actors' emotional attractiveness varied depending on the emotional expression they displayed, $F(4, 190) = 33.28, p < .001$ (see Table 1, column 4). Tukey's HSD comparisons revealed that, as expected, actors were perceived to be more attractive when displaying happy expressions as compared to the other emotional expressions, all $p_s < .001$. These findings match those for the

previously mentioned attractiveness ratings. While actors were expected to be perceived as less attractive when displaying either angry or fearful expressions as compared to the other emotional expressions, actors were only perceived as less attractive when displaying fearful expressions as compared to happy, sad, and surprised expressions, all $p_s < .01$. These findings are similar to those previously mentioned, except that, for the previous ratings, only surprised and neutral expressions were found to be more attractive than fearful expressions. These data suggest that displaying happy expressions, as compared to the other emotional expressions, enhanced actors' attractiveness, while displaying fearful expressions, as compared to happy, sad, and surprised expressions, reduced actors' attractiveness.

2. Emotional Babyfacedness

A one-way analysis of variance was performed to compare actors' emotional babyfacedness ratings for happy, sad, angry, surprised, and fearful expressions. As predicted, actors' emotional babyfacedness varied depending on the expression they displayed, $F(4, 190) = 13.90, p < .001$ (see Table 1, column 5). While actors were expected to be perceived as less babyfaced when displaying angry expressions as compared to happy or fearful expressions, Tukey's HSD comparisons revealed that actors were perceived as less babyfaced when displaying angry expressions as compared to all other emotional expressions, all $p_s < .01$. These findings match those for the previously mentioned babyfacedness ratings. These data suggest that actors were seen as less babyfaced when displaying angry expressions.

B. Emotional Attractiveness Predicting Person Identity Recognition

In the present study, actors were expected to be more memorable if they were perceived to be either very attractive or very unattractive, as compared to actors who were perceived to be neither very attractive nor very unattractive, regardless of the emotional expression they

displayed. Curve fit estimations were calculated to explore whether either a linear model or a quadratic model fit the relationship between emotional attractiveness and memorability, emotional attractiveness and participants' confidence in the accuracy of their recognition judgments, and emotional attractiveness and the time it took participants to make their recognition judgments for each expression. Actors' memorability was defined as the percentage of participants who correctly identified an actor as previously seen. In other words, because the emotional attractiveness of the actors was predicted to influence actors' memorability, this was a measurement study. Participants' confidence in the accuracy of their recognition judgments was defined as the mean confidence rating for each actor. Participants' time to make their recognition judgments was defined as the mean time elapsed before participants made each recognition judgment.

Although actors' emotional attractiveness was expected to be related to actors' memorability for all expressions, actors' emotional attractiveness was only related to memorability for actors previously seen displaying surprised expressions, and this relationship was best explained with a linear model, $F(1, 23) = 4.73, p < .05$ (see Table 2). Specifically, actors previously seen displaying surprised expressions were more likely to be recognized from their neutral expressions when their surprised expressions were perceived as less attractive. Although emotional attractiveness was not related to participants' confidence in the accuracy of their reaction judgments, $F(1, 23) = 1.02, p = .32$, there was a trend for emotional attractiveness to be related to the time it took participants to make their recognition judgments, and this relationship was best explained with a linear model, $F(1, 23) = 3.45, p = .08$. In other words, there was a trend for participants to make their recognition judgments more quickly when actors' surprised expressions were perceived as more attractive.

Table 2. Curve Fit Estimation for Linear and Quadratic Models Predicting Memorability for Actors Previously Seen Displaying Surprised Expressions (N = 25)

Model	R^2	B	$SE\ B$	β
Linear	.17	-9.46	4.35	-.41
Quadratic	.17	-.94	7.31	-.03

C. Emotional Attractiveness and Emotional Babyfacedness Predicting Person Identity Recognition

The present study was designed to explore the influence of the facial characteristics attractiveness and babyfacedness on person identity recognition for actors displaying emotional expressions. Fearful, happy, and angry expressions were of particular interest because, as previously mentioned, those emotional expressions seem to influence person identity recognition in unexpected ways. Fearful expressions have more babyfaced features than either happy or angry expressions, meaning that actors who appeared more babyfaced than average when displaying fearful expressions should appear especially distinctive and possibly more attractive due to the increased babyfacedness. For actors displaying fearful expressions, appearing both more babyfaced and more attractive may make these actors appear especially attractive and, therefore, especially memorable. In the present study, then, actors who appeared both more attractive and more babyfaced were expected to be more memorable than actors who appeared to have any other combination of attractiveness and babyfacedness, but only when displaying fearful expressions, as compared to actors displaying either happy or angry expressions.

While actors were expected to be more memorable if they were either very attractive or very unattractive, as compared to actors who were neither very attractive nor very unattractive, no evidence of a curvilinear relationship between emotion attractiveness and actors'

memorability was found for actors displaying any of the emotional expressions. In the following analyses, therefore, it was decided to assess only linear relationships among the data.

Specifically, hierarchical multiple regression analyses (Aiken & West, 1991) were performed for actors displaying happy, angry, and fearful expressions to compare the likelihood that either emotional attractiveness or emotional babyfacedness influenced actors' memorability, participants' confidence in the accuracy of their recognition judgments, or the time it took participants to make their recognition judgments, to the likelihood that the interaction of emotional attractiveness and emotional babyfacedness influenced the same variables.

As expected, there was a trend for the interaction of emotional attractiveness and emotional babyfacedness to influence actors' memorability when actors displayed fearful expressions, $F(3, 21) = 2.37$, $\Delta F = 3.59$, $p = .10$ (see Table 3). To explore this interaction, simple slope tests (Aiken & West, 1991) were performed. To conduct the simple slope tests, emotional babyfacedness was divided into two groups – a group for actors who were more babyfaced (*high emotional babyfacedness*), created by adding the mean emotional babyfacedness to emotional babyfacedness judgments, and a group for actors who were less babyfaced (*low emotional babyfacedness*), created by subtracting the mean emotional babyfacedness from emotional babyfacedness judgments. Then, for each babyfacedness group, the likelihood that emotional attractiveness, emotional babyfacedness, and the interaction of emotional attractiveness and emotional babyfacedness influenced actors' memorability was assessed using a linear regression.

Table 3. Hierarchical Regression Analysis Summary for Attractiveness and Babyfacedness Variables Predicting Memorability for Actors Previously Seen Displaying Fearful Expressions (N =25)

Step and predictor variable	<i>B</i>	<i>SE B</i>	β	R^2	ΔR^2
Step 1:				.13	.13
Emotional attractiveness	-4.75	4.86	-.20		
Emotional babyfacedness	5.10	3.81	.27		
Step 2:				.25	.13
Emotional attractiveness x Emotional babyfacedness	23.96	12.64	.97		

As predicted, only very babyfaced actors were more likely to be remembered when their fearful expressions were perceived as more attractive, $F(3, 21) = 2.37, p = .10$ (see Table 4 and Figure 1). Actors displaying fearful expressions, therefore, were more likely to be remembered when they were found to be both more babyfaced and more attractive. These data suggest that, for actors displaying fearful expressions, neither perceived attractiveness nor perceived babyfacedness, individually, predicted the likelihood that actors would be remembered as well as the interaction of these two variables. Specifically, actors were more likely to be remembered when they were found to be both more attractive and more babyfaced, as compared to any other combination of perceived attractiveness and perceived babyfacedness.

Table 4. Regression Analysis Summary for Attractiveness and Babyfacedness Variables Predicting Memorability for Actors Previously Seen Displaying Fearful Expressions with High Emotional Babyfacedness (N = 25)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Emotional attractiveness (centered value)	-19.97	9.25	-.83	-2.16	.04
High emotional babyfacedness	-.30	4.59	-.02	-.07	.95
Emotional attractiveness x High emotional babyfacedness	23.96	12.64	.75	1.90	.07

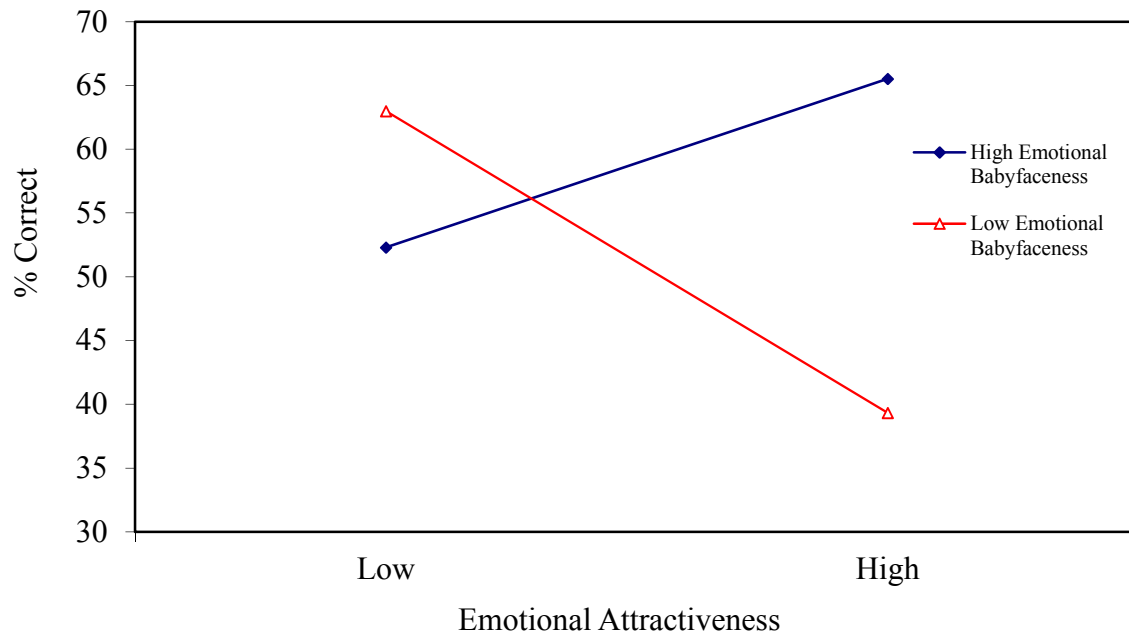


Figure 1. Interaction between emotional attractiveness and emotional babyfacedness predicting actors' memorability when previously seen displaying fearful expressions.

IV. DISCUSSION

The present study hypothesized that emotional attractiveness would predict how well actors were remembered, regardless of expression displayed, and that the interaction of emotional attractiveness and emotional babyfacedness would predict how well actors previously seen displaying fearful expressions, but not actors displaying happy or angry expressions, were remembered. The results of this study partially supported both hypotheses. For the first hypothesis, actors tended to be more memorable when their surprised expressions were found to be less attractive. For the second hypothesis, there was a trend for actors to be more memorable when their fearful expressions were seen as both more attractive and more babyfaced, as compared to any other combination of attractiveness and babyfacedness, and the interaction of emotional attractiveness and emotional babyfacedness did not predict memorability for actors displaying either happy or angry expressions.

Finding that actors were more memorable only when their surprised expressions appeared less attractive was unexpected. Previous studies exploring the relationship between attractiveness and actors' memorability have found that actors who appear either unattractive or very attractive are more memorable than actors who appear moderately attractive (Fleishman et al., 1976; Light et al., 1981; Maner et al., 2003; Marzi & Viggiano, 2010; Shepherd & Ellis, 1973; Wiese et al., 2014). While these studies have only used actors displaying neutral expressions, it was assumed that the influence of attractiveness would make actors more memorable, regardless of the emotional expression they displayed. The present study, therefore, points to the need for more

exploration into the influence of the interaction between emotional expression and attractiveness on actors' memorability. One explanation for why actors were more memorable when their surprised expression appeared less attractive may be that these expressions, especially when they appear less attractive, may draw more of participants' attention. Surprised expressions, themselves, may draw participants' attention because they are typically displayed quickly before another emotion, such as happiness or anger, which clarifies the nature of the surprising stimulus (Ekman & Friesen, 2003). Participants may pay attention to surprised expressions, then, because they are anticipating what may have caused the actor to display the expression. When these expressions appear less attractive, furthermore, they may draw even more attention from participants as appearing less attractive likely makes the expressions appear more distinctive. Actors who appear less attractive when displaying surprised expressions may be more memorable, then, because participants are paying more attention to these actors.

Finding that actors who appeared both more attractive and more babyfaced when displaying fearful expressions, but not happy or angry expressions, were more memorable was not unexpected. The hypothesis that the interaction between emotional attractiveness and emotional babyfacedness would predict memorability for actors displaying fearful expressions, but not happy or angry expressions, was developed, in part, from previous findings indicating that actors displaying fearful expressions were more memorable than actors displaying happy expressions (Righi et al., 2012; Sergerie, Lepage, & Armony, 2005; Wang, 2013), even though actors displaying happy expressions were more memorable than actors displaying angry expressions (D'Argembeau & Van der Linden, 2007, 2011; D'Argembeau et al., 2003). The results of the present study, therefore, could help to explain these previous findings as they suggest that the interaction between emotional attractiveness and emotional babyfacedness

influences memorability for actors displaying fearful expressions, but not for actors displaying either happy or angry expressions. Perhaps actors displaying fearful expressions are more memorable than actors displaying happy expressions because of the influences of emotional attractiveness and emotional babyfacedness. Before unpacking the implications of the present study, however, it's important to consider why these findings may have occurred.

Happy, angry, and fearful expressions differ in terms of emotional attractiveness and emotional babyfacedness. In the present study, happy expressions were perceived to be more attractive than either angry or fearful expressions, while angry expressions were perceived as less babyfaced than either happy or fearful expressions. As compared to happy and angry expressions, then, fearful expressions were found to be neither very attractive nor unattractive, neither very babyfaced nor less babyfaced. Because fearful expressions, in general, were seen as moderately attractive and moderately babyfaced, as compared to happy and angry expressions, actors appearing both more attractive and more babyfaced when displaying fearful expressions may be more distinctive than actors who appeared to have any other combination of attractiveness and babyfacedness when displaying these expressions.

Appearing more attractive and more babyfaced may not have influenced memorability for actors displaying happy and angry expressions in the same way due to the inherent emotional attractiveness and emotional babyfacedness of these expressions. Happy expressions, for example, were perceived as more attractive than angry or fearful expressions. So, actors displaying happy expressions who were perceived as more attractive than other actors displaying happy expressions were less likely to be distinctive. They were, simply, the most attractive actors in a group of other attractive actors. Angry expressions, on the other hand, were perceived as less attractive than happy expressions and less babyfaced than either happy or fearful expressions.

Actors displaying angry expressions who were perceived as more attractive and more babyfaced, then, may have been perceived as moderately attractive and moderately babyfaced, in comparison to actors displaying the other emotional expressions. In the present study, actors were expected to be more memorable when they were perceived to be both very attractive and very babyfaced. If the actors who were perceived to be the most attractive and most babyfaced when displaying angry expressions were only perceived as moderately attractive and moderately babyfaced in comparison to actors displaying other expressions, then these actors displaying angry expressions may not have been distinctive enough to be memorable.

Emotional attractiveness and emotional babyfacedness, then, may influence memorability for actors displaying fearful expressions, but not for actors displaying happy or angry expressions, due to the distinctiveness of actors displaying fearful expressions who appear both more attractive and more babyfaced. Participants are likely to pay attention to distinctive actors and, therefore, remember more of these actors. One area for future exploration, therefore, is the role of distinctiveness in the influence of emotional attractiveness and emotional babyfacedness on memorability for actors displaying different emotional expressions.

While the present study provides some evidence to suggest that emotional attractiveness and emotional babyfacedness may play a role in memorability for actors displaying emotional expressions, these influences were not nearly as strong as anticipated. Based on the results of previous studies (Fleishman et al., 1976; Light et al., 1981; Maner et al., 2003; Marzi & Viggiano, 2010; Shepherd & Ellis, 1973; Wiese et al., 2014), attractiveness was expected to influence actors' memorability, regardless of emotional expression. There are a few possible explanations for the null finding in the present study. One explanation is that emotional attractiveness was normally distributed in the photo set that was used, meaning that there were

few actors who were either very attractive or very unattractive displaying each emotional expression. There may not have been enough very attractive or very unattractive actors, therefore, to detect the influence of emotional attractiveness on actors' memorability. Another explanation is the small sample size ($n = 25$) used in the study. Having participants view more actors should mean that participants would see more very attractive and very unattractive actors. Future studies, therefore, should include larger numbers of very attractive and very unattractive actors.

Despite the limitations, the present study suggests that emotional attractiveness and emotional babyfacedness do play a role in memorability for actors displaying surprised and fearful expressions. Previous studies demonstrated influences of attractiveness on memorability, but only for actors displaying neutral expressions. The present study extends those findings to examine the role played by emotional attractiveness in memorability for actors displaying emotional expressions. The present study also explores the role of emotional babyfacedness in actors' memorability, which has not been investigated previously.

These findings are important as they add to previous research suggesting that emotional expressions influence actors' memorability through the emotional meaning of various expressions (D'Argembeau & Van der Linden, 2007, 2011; D'Argembeau, et al., 2003). Specifically, these findings suggest that, in addition to the emotional significance of an expression, characteristics, such as emotional attractiveness and emotional babyfacedness, associated with that expression may also influence actors' memorability. One question raised by these findings, then, is whether the influence of such facial characteristics on memorability for actors displaying emotional expressions occurs independently of or in combination with the emotional meaning of these expressions. Intuition suggests that emotional babyfacedness and

emotional attractiveness may influence the emotional meaning of different emotional expressions, which may, in turn, influence actors' memorability.

By exploring the influence of emotional attractiveness and emotional babyfacedness on actors' memorability, the present study broadens the discussion on the influence of emotional expression on person identity recognition. Previous research indicates that meanings associated with happy, angry, and fearful expressions may explain why actors previously seen displaying fearful expressions are more memorable than actors previously seen displaying happy expressions (Righi et al., 2012), and actors previously seen displaying happy expressions are more memorable than actors previously seen displaying angry expressions (D'Argembeau & Van der Linden, 2007, 2011; D'Argembeau et al., 2003). The current research suggests that emotional attractiveness and emotional babyfacedness also influence memorability for actors displaying different emotional expressions. Whether these characteristics influence memorability separately from the meanings associated with emotional expressions or in conjunction with these meanings remains to be determined. Nevertheless, as demonstrated by the present study, it is not enough to say that the meanings of emotional expressions influence person identity recognition for actors displaying different emotional expressions. Emotional attractiveness and emotional babyfacedness need to be considered as well, and future research may indicate that other facial characteristics further explain how emotional expressions influence person identity recognition. Altogether, these findings may help researchers to better understand the processes by which people recognize people they have previously seen across a wide variety of situations and while displaying different emotional expressions.

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